Course Number and Title: PHY 206 General Physics II

Campus Location:
Georgetown, Dover, Stanton, Wilmington

Effective Date:
2020-51

Prerequisite:
PHY 205, MAT 190

Co-Requisites:
None

Course Credits and Hours:
4.00 credits
3.00 lecture hours/week
3.00 lab hours/week

Course Description:
This course introduces students to physics concepts and its applications to science and industry. Topics include electric fields and electric forces, electric energy, potential and capacitance, current, resistance and DC circuits, RC circuits, magnetism and inductance, AC circuits, waves, sound, and geometrical and wave optics.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
None

Schedule Type:
Classroom Course

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Analyze electrostatic systems using forces, fields, and potential. (CCC 2, 6)
2. Synthesize strategies for the investigation of direct current circuits. (CCC 2, 6)
3. Analyze magnetostatic systems using magnetic forces and fields. (CCC 2, 6)
4. Analyze electromagnetic induction and alternating current circuits. (CCC 2, 6)
5. Integrate the principles of traveling and standing waves with emphasis on sound waves. (CCC 2, 6)
6. Analyze the properties of electromagnetic waves and applications in wave optics. (CCC 2,6)
7. Synthesize the principles of geometrical optics and apply to optical instruments. (CCC 2, 6)
8. Demonstrate an understanding of introductory quantum and atomic physics. (CCC 2, 6)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Analyze electrostatic systems using forces, fields, and potential.
    1. Discuss the structure of matter in terms of electric charge.
    2. Contrast the methods of charging objects.
    3. Apply Coulomb's law to electrostatic arrangements of multiple charges.
    4. Explain the concept of the electric field, and determine the field created by a single charge.
    5. Calculate resultant electric fields and forces using superposition of multiple electric fields.
    6. Calculate electric potential energy of charge distributions and the electric potential of a point charge.
    7. Compute the motion of charged particles in electric potentials using the conservation of energy principle.
    8. Differentiate the structure of equipotential surfaces and electric field lines around charge distributions.
    9. Calculate the capacitance, charge, voltage, and energy for a single capacitor and arrays of capacitors.
2. Synthesize strategies for the investigation of direct current circuits.
    1. Define and calculate electric current and electromotive force (EMF).
    2. Calculate resistance and resistivity of wires and examine their temperature dependence.

3. Define *Ohm's law,* and apply the law to resistor circuits.
4. Compute power and energy in electrical circuits.
5. Analyze circuits using series and parallel reductions.
6. Apply Kirchhoff's rules to solve for current and voltage in circuit elements.
7. Calculate voltage and current as functions of time in RC circuits.

3. Analyze magnetostatic systems using magnetic forces and fields.
    1. Differentiate between magnets, magnetic materials, and magnetic fields.
    2. Determine the magnetic forces on a current-carrying wire, the magnetic force on a moving charged particle, and the torque on a current loop.
    3. Describe and compute the motion of charged particles in uniform magnetic fields.
    4. Calculate the magnetic fields created by a single current-carrying wire and by configurations of these wires.
    5. Combine magnetostatic laws to determine forces and torques between current carrying wires.
4. Analyze electromagnetic induction and alternating current circuits.
    1. Calculate motional EMF, and apply Lenz's and Faraday's laws to conducting wires in magnetic fields.
    2. Explain the working principles behind generators, motors, and transformers.
    3. Determine the inductance of different wire arrangements.
    4. Describe the operating principles of transformers, and calculate voltage and current in principal and secondary coils.
    5. Distinguish between direct current and alternating current circuits.
    6. Determine the reactance and impedance in AC circuits with resistors, capacitors, and inductors.
    7. Calculate root-mean-square values of current and voltage in AC circuits.
    8. Analyze RLC series and resonant circuits.
5. Integrate the principles of traveling and standing waves with emphasis on sound waves.
    1. Describe the physical properties of traveling waves.
    2. Differentiate between snapshot and history graphs, and create one of these graphs given the other.
    3. Discuss the characteristics of sound waves with emphasis on phenomena created by different speeds in different media.
    4. Calculate the intensity and loudness of sound.
    5. Apply the Doppler effect to determine the change in frequency of sound waves.
    6. Apply the principle of superposition to the creation of standing waves.
    7. Analyze standing waves in a string to determine unknown parameters of the medium and waves.
    8. Analyze standing sound waves to determine unknown parameters of the medium and waves.
    9. Describe the interference of waves from two sources including the phenomena of beats.
6. Analyze the properties of electromagnetic waves and applications in wave optics.
    1. Examine the properties of electromagnetic waves, including energy and momentum transfer.
    2. Examine the diffraction of light by a single slit.
    3. Compute the intensity of light passing through different combination of polarizers.
7. Synthesize the principles of geometrical optics and apply to optical instruments.
    1. Employ the principle of ray approximation to understanding reflection and refraction of light.
    2. Determine the path of rays being reflected and refracted at different surfaces using geometrical optics principles.
    3. Relate the properties of refraction to explain dispersion and total internal reflection.
    4. Construct ray diagrams, and solve the mirror equation to determine images created by mirrors.
    5. Construct ray diagrams, and solve the thin lens equation to determine images created by single and dual lenses.
    6. Distinguish between the optics of the eye, simple magnifier, compound microscope, and the telescope.
8. Investigate physics principles using experimental techniques.
    1. Verify the force/charge relationship expressed by Coulomb's law.
    2. Map an electric field and equipotential contours.
    3. Assemble a configuration of batteries and capacitors, and determine the voltage across each capacitor.
    4. Construct an RC circuit, and determine the value of its time constant.
    5. Measure the resistance of a series/parallel combination of resistors.
    6. Produce a current by electromagnetic induction, and measure its value.
    7. Observe the voltage/current phase relationship in an RLC circuit using an oscilloscope.
    8. Measure the speed of sound in air.
    9. Measure the focal lengths of concave mirrors and convex and concave lenses.
    10. Construct a telescope using two convex lenses.
    11. Measure Brewster's angle and verify Malus' law.

Evaluation Criteria/Policies:
Students must demonstrate proficiency on all CCPOs at a minimal 75 percent level to successfully complete the course. The grade will be determined using the Delaware Tech grading system:

92	**–**	**100**	**=**	**A**
83	**–**	**91**	**=**	**B**
75	**–**	**82**	**=**	**C**
0	**–**	**74**	**=**	**F**

Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:
Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
3 – 4 Unit Tests* (summative) (equally weighted)	50%
Final Exam** (summative)	15%
Labs (summative) (equally weighted)	20%
Other – Homework, Quiz, Projects (formative)	15%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):
None

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.